

IN THE CLAIMS

This listing of claims replaces all prior listings and versions of the claims.

Listing of Claims:

Claim 1 (Currently Amended): A transfer apparatus comprising:

a belt that rotates and carries either one of a plurality of images directly and a recording material with a plurality of images, wherein a scale is provided along at least one side of a portion of the belt;

a sensor that reads the scale on the belt to obtain scale information;

an actual speed calculating unit that calculates a speed of the belt from the scale information;

a speed calculating unit that calculates the speed of the belt from information other than the scale information; and

a control unit that provides a control ~~the~~ to correct the speed of the belt according to the speed calculated.

Claim 2 (Previously Amended): The transfer apparatus according to claim 1, further comprising a motor that rotates the belt, and a speed detector that detects a number of revolutions of the motor, wherein

the speed calculating unit calculates the speed of the belt from the number of revolutions of the motor detected by the speed detector.

Claim 3 (Previously Amended): The transfer apparatus according to claim 2, further comprising:

a drive roller that rotatably supports the belt and drives the belt, wherein the torque of the motor is transmitted to the drive roller; and

a frictional force increasing unit, provided on a surface of the drive roller, that obtains a nonskid surface of the drive roller with respect to the belt.

Claim 4 (Previously Amended): The transfer apparatus according to claim 1, further comprising a driven roller that rotatably supports the belt, and a speed detector that detects a number of revolutions of the driven roller, wherein

the speed calculating unit calculates the speed of the belt from the number of revolutions of the driven roller detected by the speed detector.

Claim 5 (Original): The transfer apparatus according to claim 2, wherein the speed detector is an encoder.

Claim 6 (Original): The transfer apparatus according to claim 4, wherein the speed detector is an encoder.

Claim 7 (Original): The transfer apparatus according to claim 1, further comprising an abnormal operation deciding unit that decides whether the speed of the belt calculated by the actual speed calculating unit is abnormal, and

the control unit provides the control to correct the speed of the belt based on the speed calculated by the speed calculating unit when the abnormal operation deciding unit decides that the speed of the belt calculated by the actual speed calculating unit is abnormal.

Claim 8 (Original): The transfer apparatus according to claim 1, wherein the control unit provides the control to correct the speed of the belt according to a difference between the speed calculated by the actual speed calculating unit and a predetermined target speed.

Claim 9 (Original): The transfer apparatus according to claim 1, wherein the control unit provides the control to correct the speed of the belt according to a combined value obtained by adding a first speed difference and a second speed difference, wherein the first speed difference is a difference between the speed of the belt calculated by the actual speed calculating unit and a predetermined target speed, and the second speed difference is a difference between the speed of the belt calculated by the speed calculating unit and the target speed.

Claim 10 (Original): The transfer apparatus according to claim 9, further comprising an abnormal operation deciding unit that decides whether the speed of the belt calculated by the actual speed calculating unit and the speed of the belt calculated by the speed calculating unit are abnormal, wherein

the control unit corrects the speed of the belt according to the combined value when the abnormal operation deciding unit decides that the speed of the belt calculated by the actual speed calculating unit and the speed of the belt calculated by the speed calculating unit are normal.

Claim 11 (Original): The transfer apparatus according to claim 10, wherein the control unit provides a control to correct the speed of the belt according to the combined value when the first speed difference exceeds a predetermined value.

Claim 12 (Original): The transfer apparatus according to claim 1, wherein the speed calculating unit includes at least two sub-speed calculating units each of which calculates

speed of the belt based on different pieces of information obtained from different detection locations.

Claim 13 (Original): The transfer apparatus according to claim 12, further comprising an abnormal operation deciding unit that decides whether the speed of the belt calculated by the actual speed calculating unit is abnormal, and

the control unit provides the control to correct the speed of the belt according to the speeds of the belt calculated by the sub-speed calculating units when the abnormal operation deciding unit decides that the speed of the belt calculated by the actual speed calculating unit is abnormal.

Claim 14 (Original): The transfer apparatus according to claim 13, further comprising:

a sub-speed calculating unit selector that selects a sub-speed calculating unit from among the sub-speed calculating units whose speed is to be used by the control unit in controlling the speed of the belt based on a distance between the belt and the detection location of each of the sub-speed calculating unit.

Claim 15 (Original): The transfer apparatus according to claim 14, further comprising:

a sub-speed calculating unit selector that selects a sub-speed calculating unit from among the sub-speed calculating units whose speed is to be used by the control unit in controlling the speed of the belt based on a distance between an intermediate transfer belt as the belt and the detection location of each of the sub-speed calculating unit.

Claim 16 (Original): The transfer apparatus according to claim 1, further comprising:  
a belt-speed-control stopping unit that inhibits control to correct the speed of the belt  
by the control unit when a single color image is formed.

Claim 17 (Previously Amended): A transfer apparatus comprising:  
a belt that rotates by torque from a motor as a stepping motor and carries either one of  
a plurality of images directly and a recording material with a plurality of images, wherein a  
scale is provided along at least one side of the entire belt;  
a sensor that reads the scale on the belt to obtain scale information;  
an actual speed calculating unit that calculates a speed of the belt from the scale  
information;  
an abnormality detection unit that decides whether the speed of the belt detected by  
the actual speed calculating unit is abnormal;  
a control unit that provides a control to correct speed of the belt according to the  
speed calculated; and  
a motor control unit that, when the abnormality detection unit decides that the speed  
of the belt detected by the actual speed calculating unit is abnormal, invalidates correction of  
the speed of the belt by the control unit and controls the stepping motor to rotate at a  
predetermined target speed.

Claim 18 (Original): The transfer apparatus according to claim 17, further  
comprising a speed calculating unit that calculates a speed of the belt from information other  
than the scale information.

Claim 19 (Previously Amended): The transfer apparatus according to claim 18, further comprising a driven roller that rotatably supports the belt, and a speed detector that detects a number of revolutions of the driven roller, wherein

the speed calculating unit calculates the speed of the belt from the number of revolutions of the driven roller detected by the speed detector.

Claim 20 (Previously Amended): The transfer apparatus according to claim 19, further comprising a frictional force increasing unit, provided on a surface of the driven roller, that obtains a nonskid surface of the driven roller with respect to the belt.

Claim 21 (Original): The transfer apparatus according to claim 19, wherein the speed detector is an encoder.

Claim 22 (Original): The transfer apparatus according to claim 18, further comprising an abnormal operation deciding unit that decides whether the speed of the belt calculated by the actual speed calculating unit is abnormal, and

the control unit provides the control to correct the speed of the belt based on the speed calculated by the speed calculating unit when the abnormal operation deciding unit decides that the speed of the belt calculated by the actual speed calculating unit is abnormal.

Claim 23 (Original): The transfer apparatus according to claim 17, further comprising an abnormal operation deciding unit that decides whether the speed of the belt calculated by the actual speed calculating unit is abnormal, wherein

the control unit provides the control to correct the speed of the belt according to a difference between the speed of the belt calculated by the actual speed calculating unit and a

predetermined target speed when the abnormal operation deciding unit decides that the speed of the belt calculated by the actual speed calculating unit is abnormal.

Claim 24 (Original): The transfer apparatus according to claim 18, wherein the control unit provides the control to correct the speed of the belt according to a combined value obtained by adding a first speed difference and a second speed difference, wherein the first speed difference is a difference between the speed of the belt calculated by the actual speed calculating unit and a predetermined target speed, and the second speed difference is a difference between the speed of the belt calculated by the speed calculating unit and the target speed.

Claim 25 (Original): The transfer apparatus according to claim 9, further comprising an abnormal operation deciding unit that decides whether the speed of the belt calculated by the actual speed calculating unit and the speed of the belt calculated by the speed calculating unit are abnormal, wherein

the control unit corrects the speed of the belt according to the combined value when the abnormal operation deciding unit decides that the speed of the belt calculated by the actual speed calculating unit and the speed of the belt calculated by the speed calculating unit are normal.

Claim 26 (Original): The transfer apparatus according to claim 25, wherein the control unit provides a control to correct the speed of the belt according to the combined value when the first speed difference exceeds a predetermined value.

Claim 27 (Original): The transfer apparatus according to claim 18, wherein the speed calculating unit includes at least two sub-speed calculating units each of which calculates speed of the belt based on different pieces of information obtained from different detection locations.

Claim 28 (Original): The transfer apparatus according to claim 27, further comprising an abnormal operation deciding unit that decides whether the speed of the belt calculated by the actual speed calculating unit is abnormal, wherein

the control unit provides the control to correct the speed of the belt according to the speeds of the belt calculated by the sub-speed calculating units when the abnormal operation deciding unit decides that the speed of the belt calculated by the actual speed calculating unit is abnormal.

Claim 29 (Original): The transfer apparatus according to claim 28, further comprising:

a sub-speed calculating unit selector that selects a sub-speed calculating unit from among the sub-speed calculating units whose speed is to be used by the control unit in controlling the speed of rotation of the belt based on a distance between the belt and the detection location of each of the sub-speed calculating unit.

Claim 30 (Original): The transfer apparatus according to claim 29, further comprising:

a sub-speed calculating unit selector that selects a sub-speed calculating unit from among the sub-speed calculating units whose speed is to be used by the control unit in



controlling the speed of the belt based on a distance between an intermediate transfer belt as the belt and the detection location of each of the sub-speed calculating unit.

Claim 31 (Original): The transfer apparatus according to claim 19, further comprising an abnormal operation deciding unit that decides whether the speed of the belt calculated by the actual speed calculating unit and the speed of the belt calculated by the speed calculating unit are abnormal, wherein

the motor control unit provides a control to rotate the stepping motor at a predetermined target speed when the abnormal operation deciding unit decides that the speed of the belt calculated by the actual speed calculating unit and the speed of the belt calculated by the speed calculating unit are abnormal.

Claim 32 (Original): The transfer apparatus according to claim 19, further comprising:

a belt-speed-control stopping unit that inhibits control to correct the speed of the belt by the control unit when a single color image is formed.

Claim 33 (Original): An image forming apparatus comprising a transfer apparatus, the transfer apparatus including

a belt that rotates and carries either one of a plurality of images directly and a recording material with a plurality of images, a scale is provided along at least one side of a portion of the belt;

a sensor that reads the scale on the belt to obtain scale information;

an actual speed calculating unit that calculates a speed of the belt from the scale information;

a speed calculating unit that calculates a speed of the belt from information other than the scale information; and

a control unit that provides a control to correct speed of the belt according to the speed calculated.

Claim 34 (Original): The image forming apparatus according to claim 33, further comprising an abnormality occurrence display unit that causes an external display unit to display notice indicating that the speed of the belt calculated by the actual speed calculating unit is abnormal when the speed of the belt calculated by the actual speed calculating unit is abnormal.

Claim 35 (Previously Amended): An image forming apparatus comprising a transfer apparatus, the transfer apparatus including

a belt that rotates by torque from a motor as a stepping motor and carries either one of a plurality of images directly and a recording material with a plurality of images, a scale is provided along at least one side of the entire belt;

a sensor that reads the scale on the belt to obtain scale information;

an actual speed calculating unit that calculates a speed of the belt from the scale information;

an abnormality detection unit that decides whether the speed of the belt detected by the actual speed calculating unit is abnormal;

a control unit that provides a control to correct speed of the belt according to the speed calculated; and

a motor control unit that, when the abnormality detection unit decides that the speed of the belt detected by the actual speed calculating unit is abnormal, invalidates correction of

the speed of the belt by the control unit and controls the stepping motor to rotate at a predetermined target speed.

Claim 36 (Original): The image forming apparatus according to claim 35, further comprising an abnormality occurrence display unit that causes an external display unit to display notice indicating that the speed of the belt calculated by the actual speed calculating unit is abnormal when the abnormality detection unit decides that the speed of the belt detected by the actual speed calculating unit is abnormal.

Claim 37 (Previously Amended): A method of correcting a speed of a belt, comprising:

reading a scale on the belt to obtain scale information, the belt being rotatable and carries either one of a plurality of images directly and a recording material with a plurality of images, wherein a scale is provided along at least one side of a portion of the belt;

calculating a speed of the belt from the scale information;

calculating a speed of the belt from information other than the scale information;

controlling the speed of the belt according to the speed calculated.

Claim 38 (Previously Amended): The method according to claim 37, further comprising deciding whether the speed calculated from the scale information is normal, wherein

the step of controlling includes controlling the speed of the belt according to a difference between the speed calculated from the scale information and a predetermined target speed when it is decided at the deciding step that the speed calculated from the scale information is normal.

Claim 39 (Previously Amended): The method according to claim 37, wherein the step of controlling includes controlling the speed of the belt according to a combined value of a first speed difference and a second speed difference when the speed of the belt calculated from the scale information and the speed of the belt calculated from information other than the scale information are normal but the first speed difference exceeds a predetermined value, wherein the first speed difference is a difference between the speed of the belt calculated from the scale information and a predetermined target speed, and the second speed difference is a difference between the speed of the belt calculated from information other than the scale information.

Claim 40 (Previously Amended): The method according to claim 37, wherein the step of calculating the speed of the belt from information other than the scale information includes

calculating speeds of the belt based on at least two different pieces of information obtained from different detection locations; and

deciding a speed of the belt, from among the speeds of the belt calculated based from at least two different pieces of information, that corresponds to a detection location that is closest to the belt as the speed of the belt that is to be used at the controlling step.

Claim 41 (Previously Amended): A method of correcting a speed of a belt, comprising:

reading a scale on the belt to obtain scale information, the belt being rotated by a stepping motor and carries either one of a plurality of images directly and a recording

material with a plurality of images, a scale is provided along at least one side of the entire belt;

calculating a speed of the belt from the scale information;

deciding whether the speed of the belt calculated from the scale information is abnormal; and

controlling the speed of the belt based on the speed of the belt calculated from the scale information when it is decided at the deciding step that the speed of the belt calculated from the scale information is normal, and controlling a speed of rotation of the stepping motor so as to be substantially the same as a predetermined target speed when it is decided step at the deciding that the speed of the belt calculated from the scale information is abnormal.

Claim 42 (Previously Amended): A method of correcting a speed of a belt, comprising:

reading a scale on the belt to obtain scale information, the belt being rotated by a stepping motor and carries either one of a plurality of images directly and a recording material with a plurality of images, a scale is provided along at least one side of the entire belt;

calculating a speed of the belt from the scale information;

calculating a speed of the belt from information other than the scale information;

deciding whether the speed of the belt calculated from the scale information and the speed of the belt calculated from the information other than the scale information are abnormal; and

controlling the speed of the belt based on the speed of the belt calculated from the scale information when it is decided at the deciding step that the speed of the belt calculated

from the scale information is normal, controlling the speed of the belt based on the speed of the belt calculated from the information other than the scale information when it is decided at the deciding step that the speed of the belt calculated from the scale information is abnormal, and controlling a speed of the stepping motor so as to be substantially the same as a predetermined target speed when it is decided at the deciding step that the speed of the belt calculated from the scale information and the speed of the belt calculated from the information other than the scale information are abnormal.